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Indian Standard
SPECIFICATION FOR ABSOLUTE ALCOHOL
(Revised)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 *June* 1964

Indian Standard
SPECIFICATION FOR ABSOLUTE ALCOHOL
(Revised)

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Indian Standard

SPECIFICATION FOR ABSOLUTE ALCOHOL

(Revised)

0. FOREWORD

0.1 This revised Indian Standard was adopted by the Indian Standards Institution on 21 January 1964, after the draft finalized by the Alcohols and Allied Products Sectional Committee had been approved by the Chemical Division Council.

0.2 This standard was first issued in 1952. Rapid strides made by the alcohol industry since then necessitated a review and revision of Indian Standard Specification for Rectified Spirit (IS : 323-1952) which was published as a revised standard in 1959 (IS : 323-1959). Consequent to the revision of this standard, a review for revision of other standards in the series had also become incumbent. In order to align them with the revised version of IS : 323-1959 the Sectional Committee responsible for the formulation of this standard agreed to revise IS : 321-1952 in which the improved sampling procedure and criteria for conformity including the methods of test given in IS : 323-1959 Specification for Rectified spirit (*Revised*) have been included. Material known as Defence Grade in the original standard has been redesignated as Special Grade in this revision. While revising, opportunity was also taken to metricize the standard.

0.3 Wherever a reference to any Indian Standard appears in this specification, it shall be taken as a reference to the latest version of the standard.

0.4 This standard is one of a series of Indian Standards on alcohols and allied products.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960 Rules for Rounding Off Numerical Values (*Revised*). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

0.6 This standard is intended chiefly to cover the technical provisions relating to the supply of absolute alcohol, and it does not include all the necessary provisions of a contract.

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for absolute alcohol. The material is intended for use as a raw material, regent and solvent in the chemical and pharmaceutical industries and for the production of power alcohol for which purpose it is partially or completely denatured.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given under 2 of IS : 323-1959 Specification for Rectified Spirit (*Revised*), shall apply.

3. GRADES

3.1 The material shall be of three grades, namely:

a) *Special Grade* to meet special requirements, such as for Defence purposes;

b) *Grade 1* for pharmaceutical and medicinal purposes; and

c) *Grade* 2 for general purposes.

4. REQUIREMENTS

4.1 Description — The material shall be clear, colourless and homogeneous liquid free from suspended matter and consisting essentially of ethanol (CH_3CH_2OH).

4.2 The material shall also comply with the requirements given in Table 1.

TABLE 1 REQUIREMENTS FOR ABSOLUTE ALCOHOL

SL No.	CHARACTERISTIC	REQUIREMENT FOR			METHOD OF TEST	
		Special Grade	Grade 1	Grade 2	Ref to Appendix	Ref to Appendix of *IS : 323-1959
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Specific gravity at 15·6°/ 15·6°C, *Max*	0·796 1	0·796 1	0·796 1	—	B
ii)	Ethanol content, percent by volume at 15·6°C, *Min*	99·50	99·50	99·50	—	C (with the modification that Table 2 given in Appendix B of this standard shall be used in place of Table 4 of *IS : 323-1959)

(*Continued*)

TABLE 1 REQUIREMENTS FOR ABSOLUTE ALCOHOL — *Contd*

Sl No.	Characteristic	Requirement for			Method of Test	
		Special Grade	Grade 1	Grade 2	Ref to Appendix	Ref to Appendix of *IS : 323-1959
(1)	(2)	(3)	(4)	(5)	(6)	(7)
iii)	Miscibility with water	Miscible	Miscible	Miscible	—	D
iv)	Alkalinity	Nil	Nil	Nil	—	E
v)	Acidity (as acetic acid), percent by weight, *Max*	0·006	0·006	0·006	—	E
vi)	Residue on evaporation, percent by weight, *Max*	0·005	0·005	0·005	—	F
vii)	Aldehyde content (as CH_3CHO), g/100 ml, *Max*	0·10	0·006	0·10	—	G
viii)	Ester content (as $CH_3COOC_2H_5$), g/100 ml, *Max*	0·02	—	—	—	H
ix)	Copper (as Cu), g/100 ml, *Max*	—	0·000 4	—	—	J
x)	Lead (as Pb), g/100 ml, *Max*	—	0·000 1	—	—	K
xi)	Methyl alcohol content	—	To satisfy the requirement of the test	—	—	L
xii)	Fusel oil content	—	To satisfy the requirement of the test	—	—	M
xiii)	Ketones, *iso*propyl alcohol and tertiary butyl alcohol	—	do	—	A	—
xiv)	Total sulphur and compounds of sulphur (as S), percent by weight, *Max*	0·001	—	—	—	P
xv)	Sulphur dioxide (as SO_2), percent by weight, *Max*	0·000 05	—	—	—	Q

*Specification for Rectified Spirit (*Revised*).

4.3 Water Content — The water content, percent by volume at 15·6°C, *Max*, when tested in accordance with IS : 2362-1963 Determination of Water by the Karl-Fischer Method, shall be 0·5 for all the three grades.

5. PACKING AND MARKING

5.1 Packing

5.1.1 The material shall be packed in such containers as agreed to between the purchaser and the supplier, subject to the provisions of the law in force in the country for the time being.

5.1.2 All containers in which the material is packed shall be dry, clean and free from substances soluble in rectified spirit and leak proof.

5.1.3 Necessary safeguards against the risk arising from the storage and handling of large volumes of flammable liquids shall be provided, and all the precautions shall be taken at all times to prevent accident by fire or explosion.

5.1.4 Except when they are opened for the purpose of cleaning and rendering them free from alcohol vapour, all containers shall be kept securely closed, unless they have been thoroughly cleaned and freed from alcohol vapour.

5.2 Marking — All containers in which the material is stored or transported shall be marked as prescribed by law in force at that time.

5.2.1 The product may also be marked with Standard mark.

5.2.1.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

6. SAMPLING

6.1 Representative samples of the material shall be drawn as prescribed in Appendix C.

7. TEST METHODS

7.1 Tests shall be conducted according to the methods prescribed in various appendices to IS : 323-1959 Specification for Rectified Spirit (*Revised*) and Appendix A to this standard. References to Appendix A of this standard and relevant appendices of IS : 323-1959 are given in col 6 and 7 of Table 1.

7.2 Quality of Reagents — Unless specified otherwise, pure chemicals and distilled water [*see* IS : 1070-1960 Specification for Water, Distilled Quality (*Revised*)] shall be employed in tests.

NOTE — ' Pure chemicals ' shall mean chemicals that do not contain impurities which affect the results of analysis.

APPENDIX A

[*Table* 1, *Item* (xiii)]

TEST FOR KETONES, *iso*PROPYL ALCOHOL AND TERTIARY BUTYL ALCOHOL

A-1. REAGENTS

A-1.1 Mercuric Sulphate Solution — Approximately 0·5 N. Mix 5 g of yellow mercuric oxide (analytical reagent grade) with 40 ml of water, and while stirring, add 20 ml of sulphuric acid [conforming to IS : 266-1961 Specification for Sulphuric Acid (*Revised*)]; and 40 ml of water and stir until completely dissolved.

A-2. PROCEDURE

A-2.1 To one millilitre of the material add 3 ml of water and 10 ml of mercuric sulphate solution and heat in a bath of boiling water.

A-2.1.1 The material shall be regarded to have passed the test if no precipitate is produced in 3 minutes.

APPENDIX B

[*Table* 1, *Item* (ii)]

TABLE 2 RELATION BETWEEN PROOF STRENGTH, SPECIFIC GRAVITY AND PERCENTAGE OF ALCOHOL BY WEIGHT AND BY VOLUME

Specific Gravity in Air at 15·6°/15·6°C	Percentage of Alcohol		Degrees Overproof
	By Weight	By Volume at 15·6°C	
(1)	(2)	(3)	(4)
0·793 6	100·00	100·00	75·35
0·793 7	99·97	99·98	75·31
0·793 8	99·93	99·96	75·28
0·793 9	99·90	99·94	75·24
0·794 0	99·87	99·92	75·21
0·794 1	99·84	99·90	75·18
0·794 2	99·81	99·88	75·14
0·794 3	99·77	99·86	75·11
0·794 4	99·74	99·84	75·07
0·794 5	99·71	99·82	75·04
0·794 6	99·68	99·80	75·01
0·794 7	99·65	99·78	74·97
0·794 8	99·61	99·76	74·94
0·794 9	99·58	99·74	74·90
0·795 0	99·55	99·72	74·87
0·795 1	99·52	99·70	74·84
0·795 2	99·49	99·68	74·80
0·795 3	99·45	99·66	74·77
0·795 4	99·42	99·64	74·73
0·795 5	99·39	99·62	74·70
0·795 6	99·36	99·60	74·66
0·795 7	99·32	99·58	74·63
0·795 8	99·29	99·56	74·59
0·795 9	99·25	99·54	74·56
0·796 0	99·22	99·52	74·52
0·796 1	99·19	99·50	75·48
0·796 2	99·16	99·48	74·45
0·796 3	99·12	99·46	74·41
0·796 4	99·09	99·44	74·38
0·796 5	99·06	99·42	74·34

(*Continued*)

TABLE 2 RELATION BETWEEN PROOF STRENGTH, SPECIFIC GRAVITY AND PERCENTAGE OF ALCOHOL BY WEIGHT AND BY VOLUME — *Contd*

SPECIFIC GRAVITY IN AIR AT 15·6°/15·6°C	PERCENTAGE OF ALCOHOL		DEGREES OVERPROOF
	By Weight	By Volume at 15·6°C	
(1)	(2)	(3)	(4)
0·796 6	99·03	99·40	74·30
0·796 7	99·00	99·38	74·27
0·796 8	98·96	99·36	74·23
0·796 9	98·93	99·34	74·20
0·797 0	98·90	99·32	74·16
0·797 1	98·87	99·30	74·12
9·797 2	98·84	99·28	74·09
0·797 3	98·80	90·26	74·05
0·797 4	98·77	99·24	74·02
0·797 5	98·74	99·22	73·98
0·797 6	98·71	99·20	73·94
0·797 7	98·67	99·18	73·91
0·797 8	98·64	99·16	73·87
0·797 9	98·60	99·14	73·84
0·798 0	98·57	90·12	73·80
0·798 1	98·54	99·10	73·76
0·798 2	98·51	99·08	73·73
0·798 3	98·47	99·06	73·69
0·798 4	98·44	99·04	73·66
0·798 5	98·41	99·02	73·62
0·798 6	98·38	99·00	73·58
0·798 7	98·34	98·98	73·55
0·798 8	98·31	98·95	73·51
0·798 9	98·27	98·93	73·48
0·799 0	98·24	98·91	73·44
0·799 1	98·21	98·89	73·40
0·799 2	98·18	98·87	73·37
0·799 3	98·14	98·85	73·33
0·799 4	98·11	98·83	73·30
0·799 5	98·08	98·81	73·26
0·799 6	98·05	98·79	73·22
0·799 7	98·01	98·77	73·18

APPENDIX C

(*Clause* 6.1)

SAMPLING OF ABSOLUTE ALCOHOL

C-1. GENERAL REQUIREMENTS OF SAMPLING

C-1.0 In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

C-1.1 Samples shall be taken in a protected place not exposed to damp air, dust or soot.

C-1.2 The sampling instrument shall be clean and dry.

C-1.3 To draw a representative sample, the contents of each container selected for sampling shall be mixed as thoroughly as possible by suitable means.

C-1.4 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

C-1.5 The samples shall be placed in suitable clean, dry and air-tight glass containers.

C-1.6 The sample containers shall be of such a size that an ullage of at least 10 percent is left after pouring in the sample.

C-1.7 Each sample container shall be sealed air-tight with a stopper after filling and marked with full details of sampling, the date of sampling and the year of manufacture of the material.

C-1.8 Samples shall be stored in a cool and dry place.

C-2. SAMPLING OF INSTRUMENTS

C-2.0 The following forms of sampling instruments may be used:

a) Weighted sampling can for taking samples from various depths of large tanks, and

b) Sampling tube.

C-2.1 Weighted Sampling Can — of suitable capacity, 500 to 1 000 ml and of such a weight as to sink readily in the material to be sampled. It is provided with a means to permit filling at any desired level and has a long chain or cord attached for the purpose (*see* Fig. 1). The metal used to weight the apparatus shall be fitted externally, as irregularities in the metal are likely to contaminate the sample if the weight is fitted internally.

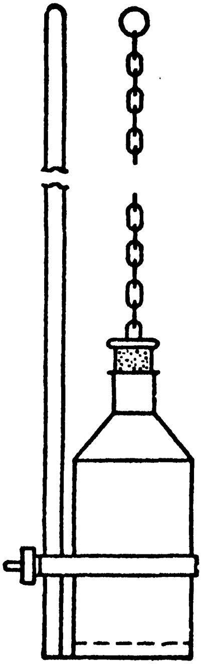

FIG. 1 WEIGHTED SAMPLING CAN

C-2.2 Sampling Tube — It is made of metal or thick glass and is 20 to 40 mm in diameter and 400 to 800 mm in length (*see* Fig. 2). The upper and lower ends are conical and reach 5 to 10 mm diameter at the narrow ends. Handling is facilitated by two rings at the upper end. For taking a sample, the apparatus is first closed at the top with the thumb or a stopper and lowered until the desired depth is reached. It is then opened for a short time to admit the material and finally closed and withdrawn.

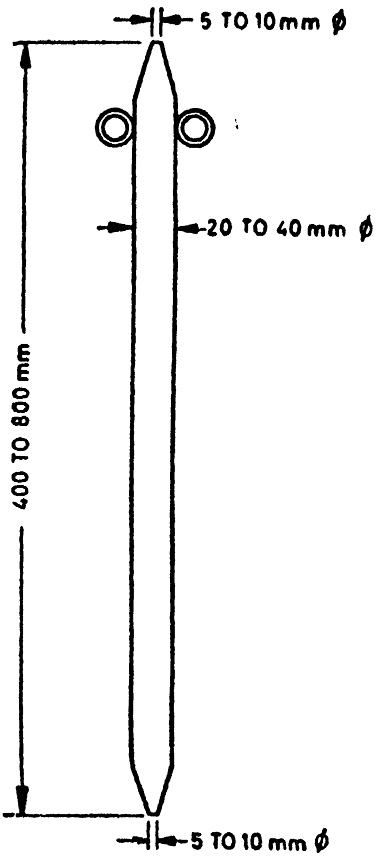

FIG. 2 SAMPLING TUBE

C-2.2.1 For small containers, the size of the sampling tube may be altered suitably.

C-3. SCALE OF SAMPLING

C-3.1 Lot — All containers of the same type in a single consignment and of one grade of the material drawn from a single batch of manufacture shall constitute the lot. If a consignment is declared or known to consist of different batches of manufacture, the batches shall be marked separately, and the group of containers of the same type in each batch shall constitute separate lots.

C-3.2 Gross Sample — The containers selected for ascertaining conformity to the specification from any lot of the material shall constitute the gross sample representing the lot. The number n of containers constituting the gross sample shall be in accordance with Table 3.

TABLE 3 SCALE OF SAMPLING

SIZE OF LOT (N)	SIZE OF GROSS SAMPLE (n)
2 to 15	2
16 to 40	3
41 to 65	4
66 to 110	7
Over 110	10

C-3.2.1 The containers shall be chosen at random from the lot. To ensure the randomness of selection, use of random number table is recommended. Where random number tables are not available, the following procedure may be adopted.

C-3.2.2 Arrange the containers in the lot systematically and, starting from any container, count them as 1, 2, 3, ... up to r. The gross sample shall consist every rth container thus counted, where

$$r = \frac{N}{n}$$

where

N = total number of containers in the lot, and
n = number of containers to be selected.

In case r comes out to be a fractional number, its value shall be taken to be equal to the integral part of it.

C-4. TEST SAMPLES AND REFEREE SAMPLE

C-4.1 Preparation of Sets of Samples for Ethanol Content — For the determination of ethanol content, draw with an appropriate sampling instrument (*see* C-2), small portions of the material from different parts of each container in the gross sample selected for sampling (*see* C-3.2) and freshly opened. To obtain samples representative of each container selected for sampling, mix these portions of the material drawn from each container. Keep these samples from different containers in separate containers. Draw three equal portions of the material each about 75 ml, from each of these separate containers and transfer them into thoroughly cleaned and dried glass bottles, thus obtaining three sets of test samples. Seal the bottles air-tight. Send one set of test samples to the purchaser and one to the supplier. Reserve the third set of test samples, bearing the seals of both the purchaser and the supplier, as referee sample, to be kept at a place agreed to between the purchaser and the supplier.

C-4.2 Preparation of Composite Sample for Determination of Characteristics Other Than Ethanol Content — Prepare a composite sample of not more than one litre by mixing equal portion of material from the samples representative of each container in the gross sample and keep it in a separate container. Divide this composite sample into three test samples, and transfer them immediately to thoroughly cleaned and dried bottles. Seal the bottles air-tight. Label as sample for general tests and give all the particulars of sampling specified in C-1.7. Send one test sample to the purchaser and one to the supplier. Reserve the third test sample, bearing the seal of the purchaser and the supplier, as referee sample to be kept at a place agreed to between the purchaser and the supplier.

C-5. NUMBER OF TESTS

C-5.1 Test for Ethanol Content — Test for the determination of ethanol content shall be carried out individually on the test samples representing the lot (*see* C-4.1).

C-5.2 Other Tests — Tests for the determination of characteristics other than ethanol content specified in Table 1 shall be carried out on the composite sample.

C-6. CRITERIA FOR CONFORMITY

C-6.1 The material shall be taken as conforming to this specification, if the test results of the test samples satisfy the requirements of C-6.2 and C-6.3. Otherwise, the lot shall be rejected.

C-6.2 When tested for requirements other than ethanol content (*see* C-5.2) the tests shall satisfy the requirements given in Table 1.

C-6.3 From the results of testing ethanol content, the mean and range shall be calculated as follows:

Mean ($\bar{x}$) = sum of the test results divided by the number of test results so added, and

Range (R) = difference between the maximum and minimum values of the test results.

The range (R) so obtained shall be multiplied by 0·6 and the expression ($\bar{x} - 0·6 R$). The following table is illustrative:

Test Results	*Mean*	*Range*	*Criterion for*
1, 2......, n	$\bar{x}$	R	($\bar{x} - 0·6R$) shall be not less than 99·50 percent by volume at 15·6°C

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BUREAU OF INDIAN STANDARDS

Headquarters:
Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones: 23230131, 23233375, 23239402 **Fax**: 91+011 23239399, 23239382
E - Mail : info@bis.org in **website** : http://www.bis.org.in

Central Laboratory:	***Telephone***
Plot No. 20/9, Site IV, Sahibabad Industrial Area, SAHIBABAD 201010	277 0032

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*Sales Office is at 5 Chowringhee Approach, P.O. Princep Street, KOLKATA 700072	2355 3243
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